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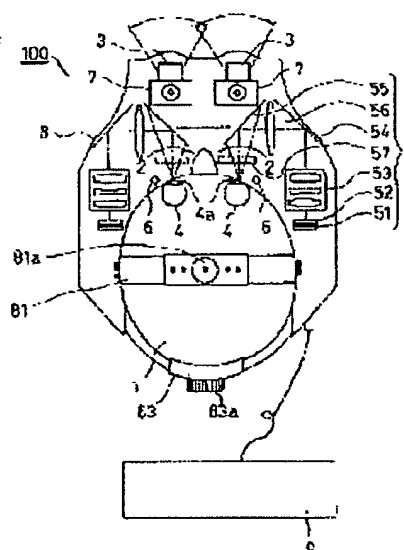
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(54) IMAGE PICKUP DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce fatigue to user of a head-mount display by making more speedy and comfortable the change in an image pickup direction concerning a head-mount display image pickup device.

SOLUTION: A head-mount display 100 is composed of a CCD camera 3 (image pickup means) for picking up the image in a visual range 2 of a user 1 mounting the display, a display device 5 (image display means) for forming the image picked up by this CCD camera 3 on the retina 4a of the user 1 of the display, a detecting means 6 for detecting a glance direction 2 of the user 1 of the display, and a drive means 7 for making the image pickup direction of the CCD camera 3 follow the glance direction 2 detected by the detecting means 6.



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Head mount display for visually handicapped, includes detector that detects person's eye direction following which drive unit makes camera track in detected eye direction

Patent Assignee: VICTOR CO OF JAPAN (VICO)

Number of Countries: 001 Number of Patents: 001

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 2000059666	A	20000225	JP 98224915	A	1998080	200021 B

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Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
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Abstract (Basic): JP 2000059666 A

NOVELTY - A detector (6) and drive unit (7) are held nearer to person's pupil (4). The detector detects eye direction of person (1) following which drive unit drives camera (3) to track in the detected eye direction. The camera photographs the person's visual field area (2) while a display unit (5) makes photographed image to form on person's retina (4a).

USE - For visually handicapped.

ADVANTAGE - The turnover of image pick-up direction is made quicker and comfortable by incorporating the eye direction detector and corresponding camera drive unit.

DESCRIPTION OF DRAWING(S) - The figure shows the top view of head mount display.

Person (1)
Visual field area (2)
Camera (3)
Pupil (4)
Retina (4a)
Display unit (5)
Detector (6)
Drive unit (7)
pp; 10 DwgNo 1/12

Title Terms: HEAD; MOUNT; DISPLAY; VISUAL; HANDICAPPED; DETECT; DETECT;
PERSON; EYE; DIRECTION; FOLLOW; DRIVE; UNIT; CAMERA; TRACK; DETECT; EYE;
DIRECTION

Derwent Class: W03; W04

International Patent Class (Main): H04N-005/225

International Patent Class (Additional): H04N-005/64; H04N-009/04

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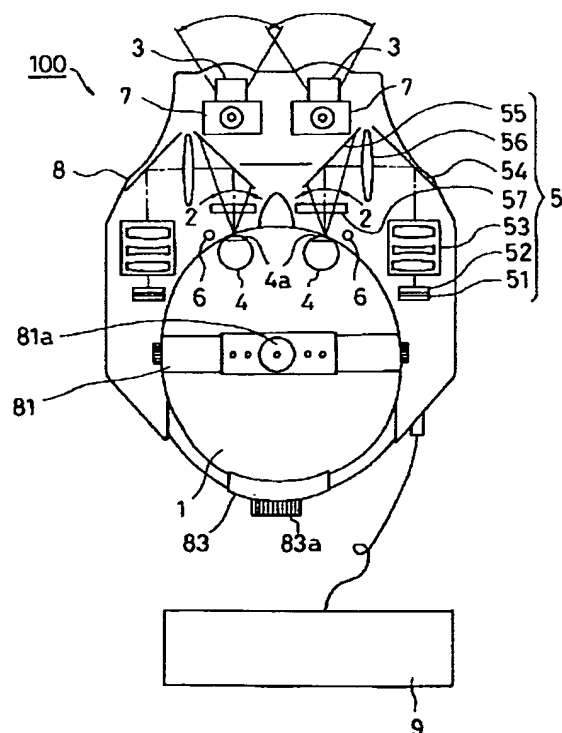
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(54) 【発明の名称】 撮像装置

(57) 【要約】

【課題】 ヘッドマウントディスプレイ形式の撮像装置における撮像方向の転換をより迅速且つ快適なものにし、被着者の疲労を低減する。

【解決手段】 ヘッドマウントディスプレイ100は、被着者1の視野領域2を撮像するCCDカメラ3（撮像手段）と、このCCDカメラ3により撮像された画像を被着者1の網膜上4aに結像させるディスプレイ装置5（画像表示手段）と、被着者1の視線方向2を検出する検出手段6と、検出手段6により検出された視線方向2にCCDカメラ3の撮像方向を追従させる駆動手段7とからなるものである。



【特許請求の範囲】

【請求項1】 被着者の視野領域を撮像する撮像手段と、
この撮像手段により撮像された画像を前記被着者の網膜上に結像させる画像表示手段と、
前記被着者の視線方向を検出する検出手段と、
前記検出手段により検出された前記視線方向に前記撮像手段の撮像方向を追従させる駆動手段と、からなることを特徴とする撮像装置。

【請求項2】 請求項1に記載の撮像装置において、前記撮像手段、前記画像表示手段、前記検出手段及び前記駆動手段を一体的に前記被着者の眼球の近傍に保持する保持手段を有することを特徴とする撮像装置。

【請求項3】 請求項1又は2に記載の撮像装置において、前記画像表示手段は、前記撮像手段により撮像された画像の中心を被着者の視線方向に移動させる画像中心移動手段を有することを特徴とする撮像装置。

【請求項4】 請求項1、2又は3に記載の撮像装置において、前記画像表示手段に表示された被写体を指定する指定手段と、この指定手段により指定された該被写体の色を知らせる色通知手段とを有することを特徴とする撮像装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、被着者の視野範囲を撮像し、その画像を被着者の網膜上に結像させるように構成された撮像装置に係り、特に、例えば弱視、色弱等の視覚障害を補正するために装着するヘッドマウントディスプレイに関する。

【0002】

【従来の技術】従来、例えば弱視や色弱等の視覚障害を補正する装置としてヘッドマウントディスプレイ形式のものが開発されている。図12は、従来の視覚障害補正用のヘッドマウントディスプレイ110を示す平面図である。

【0003】同図において、ヘッドマウントディスプレイ110は、被着者111の視野領域112を撮像するCCDカメラ113と、このCCDカメラ113により撮像された画像を被着者111の網膜114上に結像させるファインダ115と、これらの各装置を一体的に被着者111の頭部に固定するための本体116とからなるものである。

【0004】詳述すると、CCDカメラ113は、被着者111の視野領域112と同等の領域117を撮像し、撮像された画像は補正されたうえで、カラーLCD118により映し出され、ミラー119により反射されて、被着者111の網膜114に対向配置されたファインダ115に映し出される。

【0005】

【発明が解決しようとする課題】しかしながら、上述し

た従来のヘッドマウントディスプレイ110では、CCDカメラ113が本体116の正面位置に固定されているため、このCCDカメラ113の撮像方向は常に本体116の正面のみとなる。

【0006】そのため、CCDカメラ113による撮像方向を変えようとするときは、被着者111は、撮像を望む方向に自己の頭部を向けることによって、本体116ごとCCDカメラ113の向き転換しなければならず、瞬時の撮像方向の転換が困難であるとともに、ヘッドマウントディスプレイ110の装着時の疲労が大きく、実用性が低下する恐れがある。

【0007】そこで、本発明は、上記事情に鑑みて成されたものであり、その目的は、ヘッドマウントディスプレイ形式の撮像装置における撮像方向の転換をより迅速且つ快適なものとするを課題とする。

【0008】

【課題を解決するための手段】上記課題を達成するために、本願請求項1に係る発明は、被着者の視野領域を撮像する撮像手段と、この撮像手段により撮像された画像を前記被着者の網膜上に結像させる画像表示手段と、前記被着者の視線方向を検出する検出手段と、前記検出手段により検出された前記視線方向に前記撮像手段の撮像方向を追従させる駆動手段とからなるものである。

【0009】このような請求項1に係る発明によれば、被着者の視線方向を検出して、その視線方向に撮像手段の撮像方向を追従させるため、被着者は、装置全体の方向を変えなくても、所望する方向を画像表示手段に映し出すことができる。

【0010】請求項2に係る発明は、請求項1に係る発明において、前記撮像手段、前記画像表示手段、前記検出手段及び前記駆動手段を一体的に前記被着者の眼球の近傍に保持する保持手段を有するものである。

【0011】このような請求項2に係る発明によれば、撮像装置を構成する各手段を一体的に装着することができるため、その着脱が容易となる。

【0012】請求項3に係る発明は、請求項1又は2に記載の撮像装置において、前記画像表示手段は、前記撮像手段により撮像された画像の中心を被着者の視線方向に移動させる画像中心移動手段を有するものである。

【0013】このような請求項3に係る発明によれば、画像表示手段によって表示される画像の中心を被着者の視線方向に移動させることによって、被着者の視線方向に追従して撮像手段の撮像方向を変えた際に、被着者が注目している対象物と、画像表示手段に表示される対象物とにずれが生じるのを防ぐことができる。

【0014】請求項4に係る発明は、請求項1、2又は3に記載の撮像装置において、前記画像表示手段に表示された被写体を指定する指定手段と、この指定手段により指定された該被写体の色を知らせる色通知手段とを有するものである。

【0015】このような請求項4に係る発明によれば、被着者が色弱等の視覚障害を有するものであっても、撮像された対象物の色を容易に認識することができる。

【0016】

【発明の実施の形態】第1の実施形態

以下に、本発明の第1の実施形態について詳細に説明する。図1は、本実施形態におけるヘッドマウントディスプレイ100の内部構成を模式的に示すものであり、図2、図3は、その外観を表した斜視図である。

【0017】図1乃至図3において、ヘッドマウントディスプレイ100は、被着者1の視野領域2を撮像するCCDカメラ3、3と、このCCDカメラ3、3により撮像された画像を被着者1の網膜4a上に結像させるディスプレイ装置5、5と、被着者1の視線方向を検出する検出手段6、6と、検出手段6、6により検出された視線方向にCCDカメラ3、3の撮像方向を追従させる駆動手段7、7とからなるものである。なお、本実施形態においては、これらの手段は電源装置9から供給される電源によって動作する。

【0018】CCDカメラ3、3は、被着者1の視野領域2、2とほぼ等しい撮像領域を有する撮像手段であり、駆動手段7、7によってその撮像方向を上下左右に転換されるものである。そして、このCCDカメラ3、3は、本実施形態では、本体8の前面部に2つ設けられているとともに、透明な半球状のフード3aにより覆われている。また、これら2つのCCDカメラ3、3は、その間隔が被着者1の眼球4、4の間隔とほぼ等しく設定され、被着者1の視線方向と撮像方向が一致するように配置されている。なお、このCCDカメラ3、3の間隔について被着者1の眼球4、4の間隔に適合させるべく、CCDカメラ3、3に間隔調整手段を設けてもよい。

【0019】ディスプレイ装置5、5は、本体8の側部に内蔵されたバックライト51、カラーLCD52及び焦点調節器53と、焦点調節53の光軸上に配置される反射鏡54、レンズ56、反射鏡55と、被着者1の眼球4に対向するように配置されるファインダ57からなるものである。

【0020】このディスプレイ装置5、5によって、CCDカメラ3で撮像された画像はバックライト51及びカラーLCD52により映し出され、焦点調節器53によりフォーカス等を調節されたうえで、反射鏡54、レンズ56、反射鏡55を経て、ファインダ57に表示される。

【0021】検出手段6、6としては、周知の技術を用いることができる。本実施形態では、赤外線を用いた方式のものを採用する。図4は、本実施形態に係る検出手段6、6をより詳細に説明するものである。

【0022】図4(a)乃至(c)に示すように、検出手段6、6は、眼球4に近接配置された赤外光源60

X、60Yから眼球4に赤外光を照射し、その反射光を光電変換素子61R、61L、61U、61Dで受光して、黒目の左右及び上下への移動を検出する。

【0023】詳述すると、黒目の左右の動きを検出する光電変換素子61R、61Lは、黒目が正面を向いた状態でそれぞれ黒目の右側及び左側からの反射光を受光するように配置され、その出力は増幅器63で増幅される。また、黒目の上下方向の動きを検出する光電変換素子61U、61Dはともに、黒目が正面を向いた状態で黒目の斜め下位置からの反射光を受光するように配置され、その出力は増幅器62で増幅される。そして、増幅器62、63からの出力は解析回路(図示せず)によって解析され、被着者1の視線方向が特定される。

【0024】駆動手段7、7は、上記検出手段6、6により検出された被着者1の視線方向に、CCDカメラ3、3の撮像方向を追従させるべくCCDカメラ3、3を上下、左右に回動させるものである。この駆動手段7、7の具体的な構成を図5及び図6に示す。なお、図5は駆動手段7の斜視図であり、図6(a)は、駆動手段7の停止状態を示し、同図(b)はその回動状態を示している。

【0025】図5及び図6(a)に示すように、CCDカメラ3は立方体状の基台70に突設されており、この基台70は水平シャフト70aにより内部フレーム71に対して上下回動可能に取り付けられている。また、基台70にはモータ73が設けられており、これにより内部フレーム71に対して上下回動され、この上下回動はブレーキ機構75により制動される。

【0026】ブレーキ機構75は、水平シャフト70aに挿通され基台70側に固定された永久磁石75aと、水平シャフト70aにスライド可能に挿通され永久磁石75aに対して磁氣的に反発するように対向配置される電磁石75bと、この電磁石75bを基台70側に押しつける皿バネ75cからなるものである。

【0027】そして、基台70を上下に回動するには、図6(b)に示すように、電磁石75bに通電してこれを永久磁石75aに対して磁氣的に反発させ、電磁石75bを永久磁石75aから離隔させてブレーキを解除し、モータ73により回動させる。電磁石75bへの通電を切断すると磁氣的な反発がなくなり、皿バネ75cの弾性力により電磁石75bが永久磁石75aに押しつけられ、基台70の回動が制動される。

【0028】また、内部フレーム71も、基台70と同様に、垂直シャフト71aにより外部フレーム72に対して左右回動可能に取り付けられている。さらに、この内部フレーム71にもモータ74が設けられており、これにより内部フレーム71は外部フレーム72に対して左右に回動されるとともに、ブレーキ機構75と同様の構成を備えたブレーキ機構76によりその回動が制御される。

【0029】また、本実施形態では、これらのCCDカメラ3、3、ディスプレイ装置5、5、検出手段6、6及び駆動手段7、7は、本体8に一体的に被着者1の眼球4の近傍に保持されている。

【0030】この本体8には、これを被着者1の頭部に保持するために、固定ベルト81、83が設けられている。固定ベルト81は、本体8を被着者1の上頭部において固定するものであり、固定ベルト83は、本体8を被着者1の後頭部において固定するものである。また、これらの固定ベルト81、83には、これの締め付け調整を行うダイヤル式のアジャスタ81a、83aが設けられている。

【0031】このような本実施形態に係るヘッドマウントディスプレイ100によれば、被着者1の視線方向を検出して、その視線方向にCCDカメラ3、3の撮像方向を追従させることができるため、被着者1は、装置全体の方向を変えなくても、所望する方向をディスプレイ装置5に映し出すことができる。

【0032】また、本実施形態では、CCDカメラ3、3の間隔と被着者1の眼球4、4の間隔とをほぼ等しくする設けられているため、ディスプレイ装置5、5によって表示される画像を、より現実感に富んだものとすることができる。

【0033】さらに、本実施形態では、ヘッドマウントディスプレイ装置100を構成する各手段を本体8に一体的に取り付けるため、これの着脱が容易となる。

【0034】第2の実施形態

以下に、本発明の第2の実施形態について詳細に説明する。本実施形態では、上述した第1の実施形態におけるディスプレイ装置5に映し出される画像の表示方式について詳述する。なお、この第2の実施形態に係るヘッドマウントディスプレイ全体の構成は前述した第1の実施形態におけるヘッドマウントディスプレイ100と同様である。

【0035】そして、特にこの第2の実施形態に係るディスプレイ装置は、CCDカメラ3、3により撮像された画像の中心を被着者1の視線方向に移動させる画像中心移動手段(図示せず)を有するものである。

【0036】この画像中心移動手段は、本実施形態においては、ディスプレイ装置5に映し出される画像を加工する演算手段であり、この演算手段は、例えば本体8に内蔵されるCPU等によって実現することができる。

【0037】以下にこの画像中心移動手段による画像の加工について図7を参照して説明する。なお、図7は、CCDカメラ3による撮像画像とディスプレイ装置5による表示画像を示すものである。

【0038】いま、図7(a)に示すように、CCDカメラ3は、手前にある円柱701を画像の中心に捕らえている。このとき、図7(b)に示すように、ディスプレイ装置5のファインダ57には円柱701が中心に映

し出されているとともに、被着者1はファインダ57の中心P1に注目している。

【0039】そして、同図(b)に示すように、被着者1が後方にある立方体702を注目すべく視線方向をP2に移したとする。すると、検出手段6は、被着者の視線方向の変化を検出し、駆動手段7によりCCDカメラ3の撮像方向を変化させる。

【0040】CCDカメラ3の撮像方向が変化されると、図7(c)に示すように、CCDカメラ3の中心には立方体702が捕らえられる。これに合わせて、図7(d)に示すように、ファインダ57では、立方体702が画像の中心P1に映し出され、被着者が注目しているP2からずれが生じることとなる。

【0041】この際、画像中心移動手段は、表示画像の中心P1から注目箇所P2への変位を算出し、表示する画像を加工する。すなわち、図7(e)に示すように、表示画像の中心P1を、P2の位置に移動させ、CCDカメラ3がその中心に捕らえている対象物を、被着者が注目するP2位置に一致させる。

【0042】なお、本実施形態においては便宜上、P1とP2との間にずれが生じた後に、これを補正すべく表示画像の中心を移動させる順で説明したが、被着者1の視線方向の変化を検出して撮像方向を変化させるのと同時に表示画像の加工を行い、駆動手段7の駆動と併行して表示画像の中心を移動させれば、スムーズに表示対象物を被着者の視線方向に映し出すことができ、被着者1に不快感を与えるのを回避することができる。

【0043】このような画像中心移動手段を有するこの第2の実施形態に係るヘッドマウントディスプレイによれば、ディスプレイ装置5に表示される画像の中心P1を被着者の視線方向P2に移動させるため、被着者の視線方向に追従してCCDカメラ3の撮像方向を変えた際に、被着者が注目している点と画像表示手段に表示される対象物との間にずれが生じるのを防ぐことができる。

【0044】なお、本実施形態においては、画像中心の移動手段として、演算手段により画像を加工するようにしたが、本発明はこれに限定されるものではない。例えば、ディスプレイ装置5のファインダ57を上下左右に移動可能な構成とし、被着者の視線方向に追従させて、ファインダ57の位置を変化するようにしてもよい。

【0045】また、この第2の実施形態に係るディスプレイ装置5、5は、撮像された被写体の輪郭を強調して表示する画像補正手段を有する。この画像補正手段は、例えば本体8内に備えられたCPU等の演算装置によって実現することができる。

【0046】かかる画像補正の方式としては、例えばCCDカメラ3で撮像された画像のコントラストを強調したり、色相を反転させたり、被写体の輪郭を抽出することによって被写体の輪郭を強調するものを採用することができる。

【0047】なお、被写体の輪郭を抽出する方法としては、例えば新たに撮像した画像と所定期間（例えば1フレーム期間）前に撮像した画像との差分をとることにより、或いは、予め背景画像を記憶しておきこれと入力画像との差分を取ることで、画像中の動きのある部分を特定し、これに雑音除去、ラベリング、特徴抽出等の処理を行う方法を用いることができる。

【0048】さらに、この第2の実施形態に係るヘッドマウントディスプレイは、ディスプレイ装置5に映し出された被写体の色を知らせる色通知手段を備えている。この色通知手段は、具体的には、例えば図8(a)に示すように、検出手段6で被着者1の視線方向P3を検出して、被着者1が注目している被写体801を特定しその色を解析するとともに、解析した色を例えば“RED”などのようにディスプレイ手段5に文字等を表示することによって通知する。

【0049】なお、この色を被着者に通知する方法としては、上述のように文字等によって表示するほか、例えば本体8に組み込まれたスピーカ（図示せず）により音声で通知することもできる。

【0050】また、本実施形態では、色を識別したい被写体の指定を検出手段6で被着者の視線方向を検出することにより行ったが、本発明はこれに限定されるものではなく、例えば図8(b)に示すようなポインタ装置90を用いて手動で指定することもできる。

【0051】すなわち、例えばポインタ装置90のグリップ93の上部に設けられたつまみ91を上下左右に動かすことにより、ディスプレイ装置5のファインダ57に映し出されるポイントP3を任意の被写体801上に移動させ、スイッチ92を押すことによりポイントP3をロックし、その被写体の色を解析し、文字や音声等によって色を通知するようにすることもできる。

【0052】このような機能を実現するための一例として、図9に示すような回路ブロックについて説明する。

【0053】撮像手段としてのCCDカメラ3からの出力を3色分解した後、A/D変換器94、94、94にてデジタル信号に変換されたR、G、Bの各信号は、それぞれレベル回路95、95、95に供給される。そして、レベル回路95、95、95の出力は制御部96に供給されることにより、それぞれの信号レベルが比較され、その結果を必要に応じて音声合成回路97を通じて増幅器98を介してスピーカ99より発音させることにより被写体の色情報を音声にて認識することができる。また、被写体の状態などの情報をも適宜発音することも可能である。

【0054】一方、認識された色情報をテキスト情報としての文字情報として出力するには制御部96からの出力は、文字コード変換部100にて所定の文字コードに変換された後、変換部101にて所定のパターン文字に変換され、ディスプレイ装置5に出力されるようになっ

ている。

【0055】このような色通知手段を備えたヘッドマウントディスプレイ装置によれば、被着者が色弱等の視覚障害を有するものであっても、その障害を補うことができる。

【0056】第3の実施形態

次に、本発明の第3の実施形態について図10を参照して説明する。同図に示すように、本実施形態に係るヘッドマウントディスプレイ200は、上述した第1の実施形態におけるヘッドマウントディスプレイ100における本体8の前部に第3の撮像手段201を設けたものである。

【0057】この第3の撮像手段201は、例えば前述したCCDカメラ3よりも広範囲を撮影できる広角カメラを用いることができる。そして、CCDカメラ3による画像と、この第2の撮像手段201による画像を適宜切り替えてディスプレイ装置5に表示することによって、被着者の好みに応じた画像を表示することができる。

【0058】第4の実施形態

さらに、本発明の第4の実施形態について図11を用いて説明する。同図に示すように、本実施形態に係るヘッドマウントディスプレイ300は、CCDカメラ3及び駆動手段7を本体301から離隔して設け、且つこれらを遠隔操作により撮像もしくは駆動するようにしたものである。

【0059】すなわち、上述したディスプレイ装置5及び検出手段6を、固定手段である本体301に一体的に取り付け、これらの手段を被着者の眼球の近傍に一体的に固定する一方、CCDカメラ3及び駆動手段7を、本体301とは別途独立に設けられた自走手段302に取り付ける。

【0060】この自走手段302は、被着者が遠隔操作により操縦され、これに取り付けられた撮像手段3によって撮像された画像を送信するものである。なお、この自走手段302は、本実施形態においては、その上部に回動可能に取り付けられた広角カメラ303を備えており、これによる広範囲を捕らえた画像と、CCDカメラ3による被着者の視線方向に追従した画像とを適宜切り替えることができるように構成されている。

【0061】このような第4の実施形態に係るヘッドマウントディスプレイ300によれば、CCDカメラ3による撮像位置と、ディスプレイ装置5による表示位置とを離隔することができるため、被着者のいる位置と異なる場所の画像を、被着者は見ることができる。このときにおいても、CCDカメラ3は被着者の視線方向に追従して撮像を行うため、このヘッドマウントディスプレイ300によれば人間が入り込めない狭小な場所や、危険な場所において、現実感に富んだ画像を撮像することができる。

【0062】

【発明の効果】以上説明したように、本発明の撮像装置によれば、ヘッドマウントディスプレイ形式の撮像装置における撮像方向の転換をより迅速且つ快適なものとし、現実感に富んだ画像を撮像できるとともに、装着時の疲労を低減することができる。

【図面の簡単な説明】

【図1】本発明の第1の実施形態に係るヘッドマウントディスプレイの平面図を示すものである。

【図2】第1の実施形態におけるヘッドマウントディスプレイの外観を示す斜視図である。

【図3】第1の実施形態におけるヘッドマウントディスプレイの外観を示す斜視図である。

【図4】本発明の第2の実施形態に係るヘッドマウントディスプレイにおける検出装置の原理を示す説明図である。

【図5】本発明の第2の実施形態に係るヘッドマウントディスプレイにおける撮像手段を拡大して示す斜視図である。

【図6】本発明の第2の実施形態に係るヘッドマウントディスプレイにおける撮像手段及び駆動手段の駆動原理を示す説明図である。

【図7】本発明の第2の実施形態に係るヘッドマウントディスプレイにおける画像表示手段の駆動原理を示す説

明図である。

【図8】本発明の第2の実施形態に係るヘッドマウントディスプレイにおける色通知手段の説明図である。

【図9】本発明の第2の実施形態に係るヘッドマウントディスプレイにおける色通知手段の機能を実現するための回路ブロック図である。

【図10】本発明の第3の実施形態に係るヘッドマウントディスプレイの平面図を示すものである。

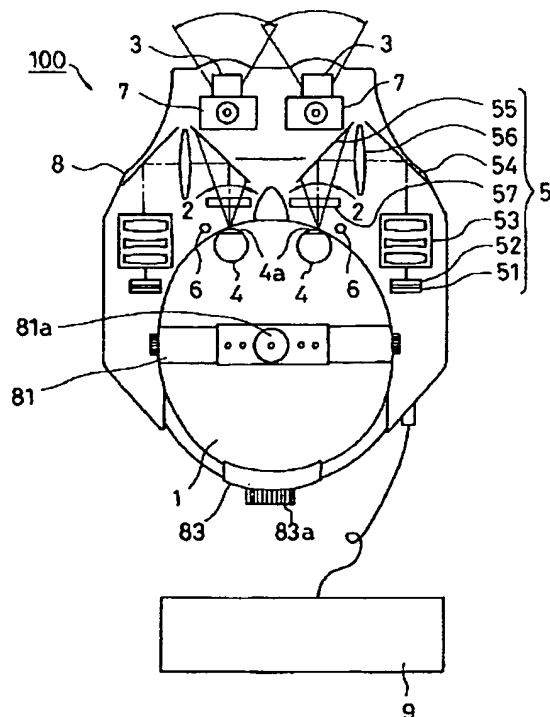
【図11】本発明の第4の実施形態に係るヘッドマウントディスプレイの平面図を示すものである。

【図12】従来のヘッドマウントディスプレイを示す図である。

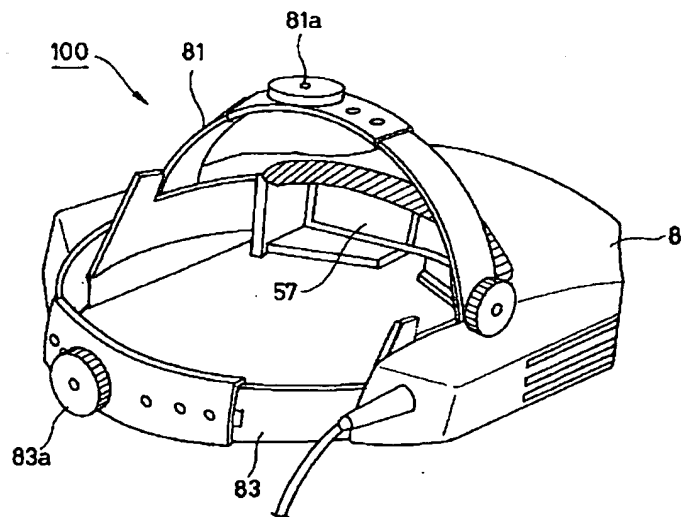
【符号の説明】

- 1 被着者
- 2 視野範囲
- 3 CCDカメラ（撮像手段）
- 4 眼球
- 4a 網膜
- 5 ディスプレイ装置（画像表示手段）
- 6 検出手段
- 7 駆動手段
- 8 本体
- 9 電源装置
- 100 ヘッドマウントディスプレイ

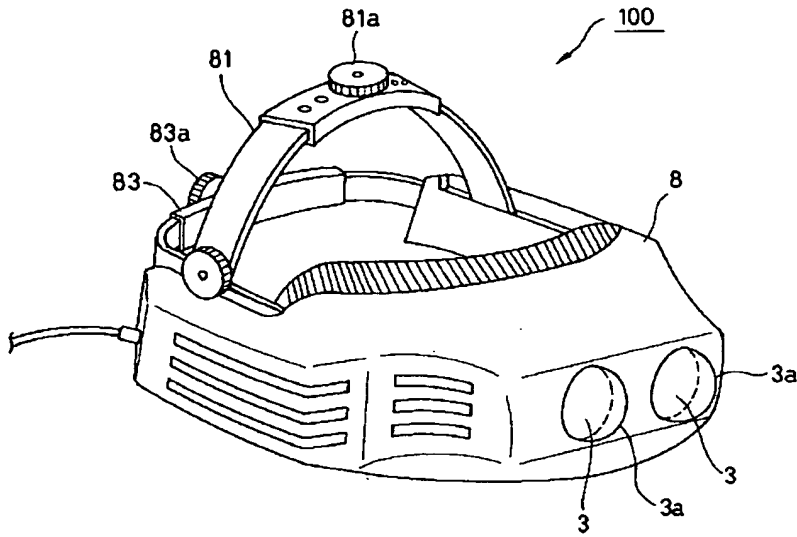
【図1】



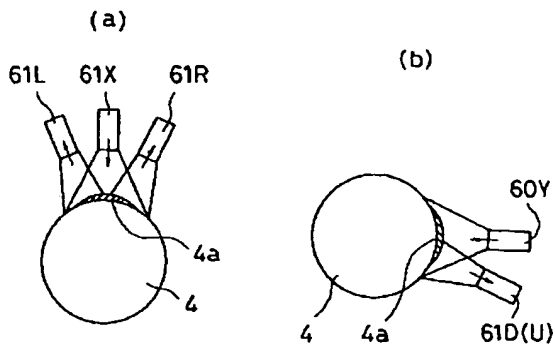
【図3】



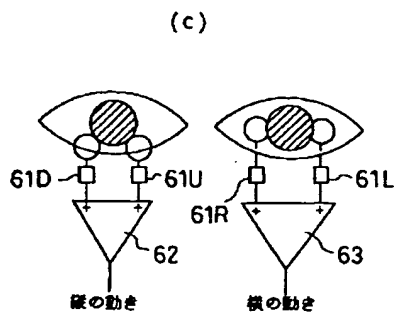
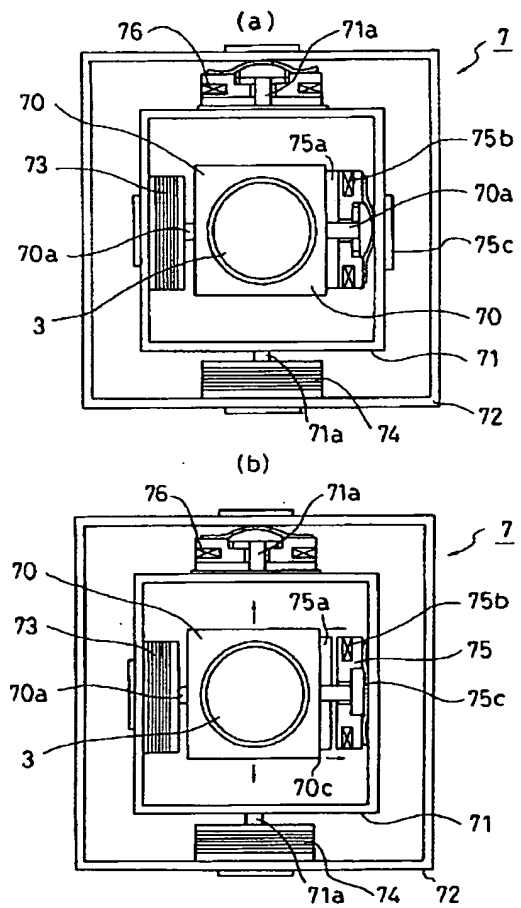
【図2】



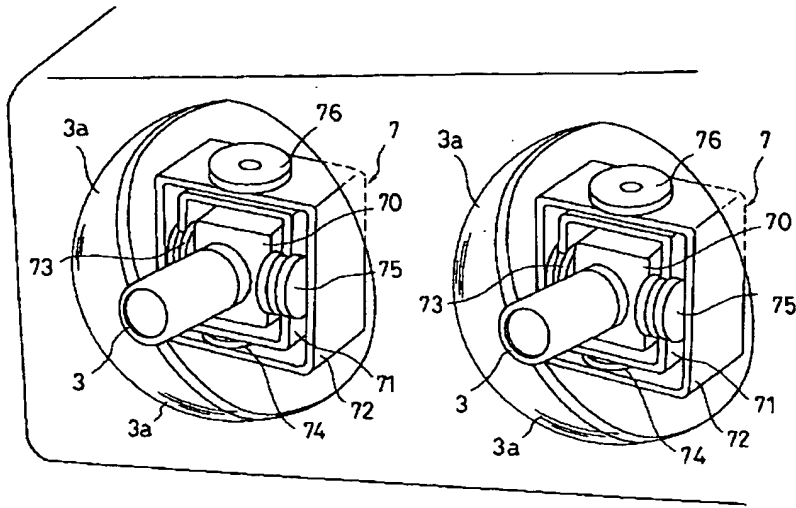
【図4】



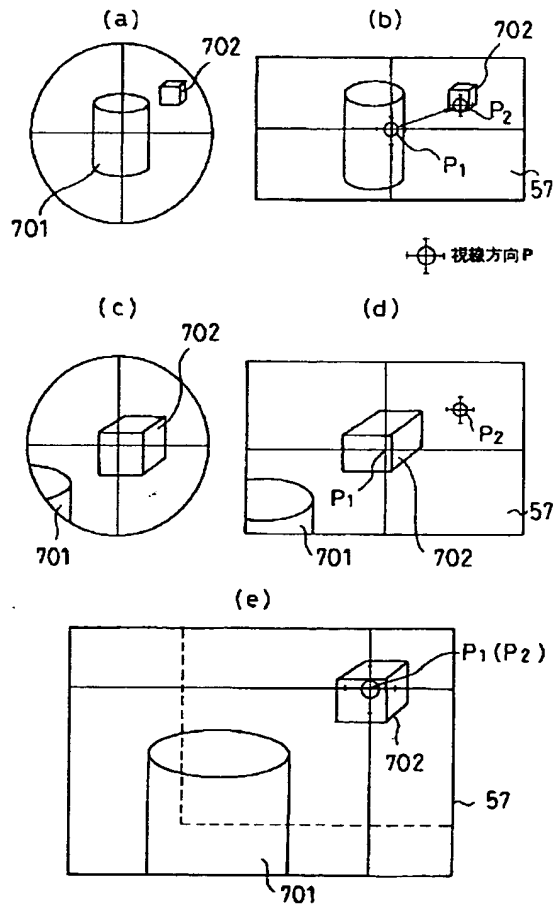
【図6】



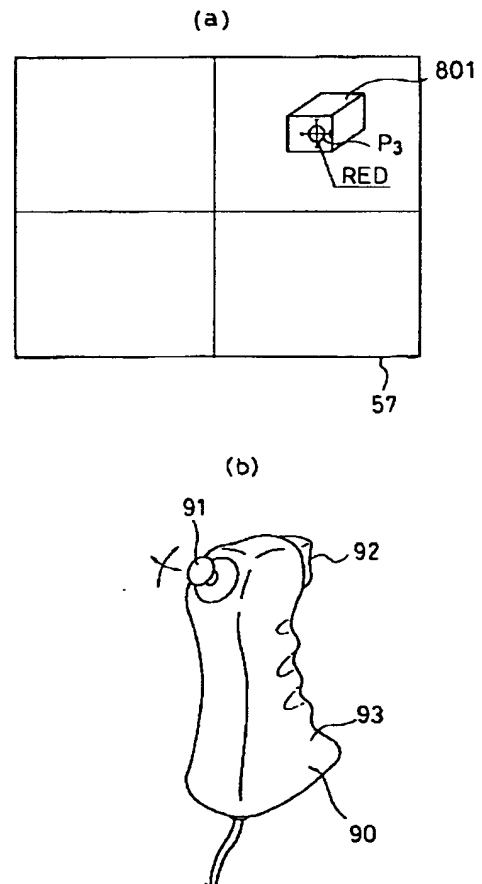
【図5】



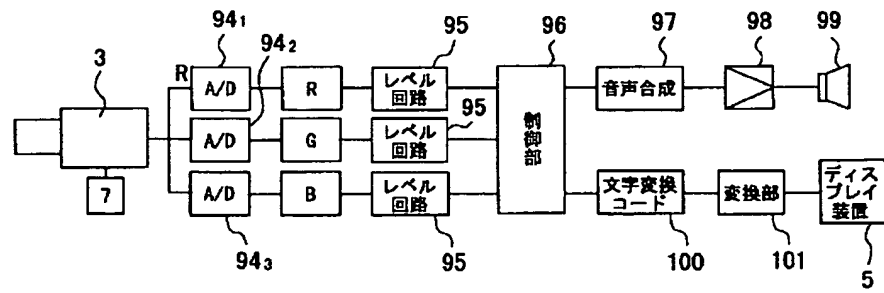
【図7】



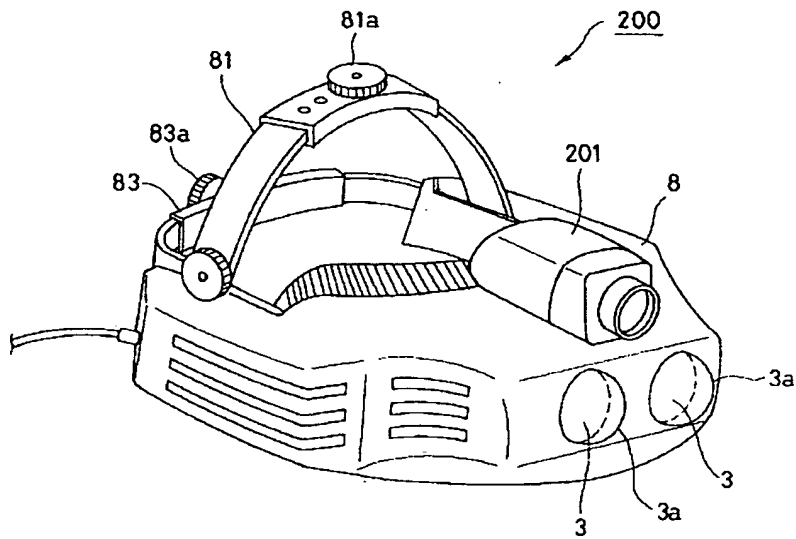
【図8】



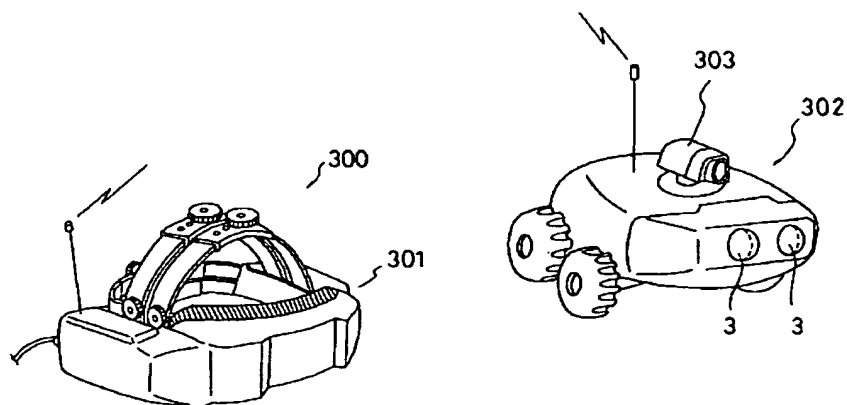
【図9】



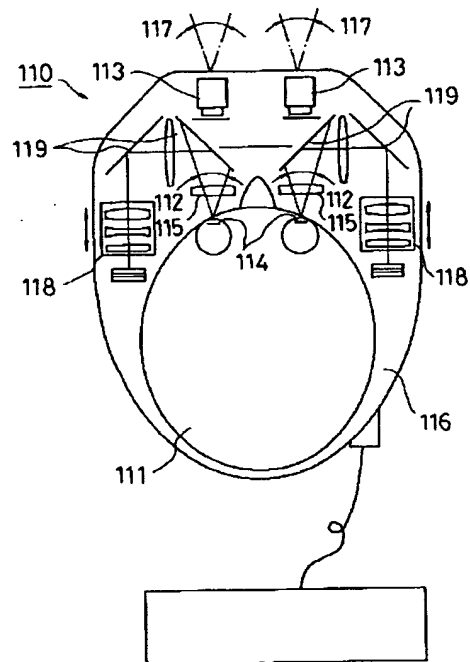
【図10】



【図11】



【図12】



フロントページの続き

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1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. **** shows the word which can not be translated.

3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] the image pick-up means of picturizing a covering person's visual field field, an image-display means carry out the image formation of the image picturized by this image pick-up means on said covering person's retina, a detection means detect said covering person's direction of a look, and the driving means that make the image pick-up direction of said image pick-up means follow in said direction of a look detected by said detection means -- since -- the image pick-up equipment characterized by to become.

[Claim 2] Image pick-up equipment characterized by having a maintenance means to hold said image pick-up means, said image display means, said detection means, and said driving means near said covering person's eyeball in one, in image pick-up equipment according to claim 1.

[Claim 3] It is image pick-up equipment characterized by having an image core migration means to move the core of an image that said image display means was picturized by said image pick-up means in image pick-up equipment according to claim 1 or 2 in a covering person's direction of a look.

[Claim 4] Image pick-up equipment characterized by having an assignment means to specify the photographic subject displayed on said image display means in image pick-up equipment according to claim 1, 2, or 3, and a notice means of a color to tell the color of this photographic subject specified by this assignment means.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention picturizes the visual field range of a covering person, relates to the image pick-up equipment constituted so that image formation of the image might be carried out on a covering person's retina, and relates to the head mount display with which it equips in order to amend visual disturbance, such as dysopsia and color amblyopia, especially.

[0002]

[Description of the Prior Art] The head mount display format is developed as equipment which amends visual disturbance, such as the former, for example, the dysopsia, and color amblyopia. Drawing 12 is the top view showing the head mount display 110 for the conventional visual disturbance amendment.

[0003] A head mount display 110 consists of CCD camera 113 which picturizes the covering person's 111 visual field field 112, a finder 115 which carries out image formation of the image picturized by this CCD camera 113 on the covering person's 111 retina 114, and a body 116 for fixing each of these equipments to the covering person's 111 head in one in this drawing.

[0004] If it explains in full detail, CCD camera 113 picturizes the field 117 equivalent to the covering person's 111 visual field field 112, and after being amended, it will project with a color LCD 118, it will be reflected by the mirror 119, and it will project the picturized image on the finder 115 by which opposite arrangement was carried out at the covering person's 111 retina 114.

[0005]

[Problem(s) to be Solved by the Invention] However, in the conventional head mount display 110 mentioned above, since CCD camera 113 is being fixed to the transverse-plane location of a body 116, the image pick-up direction of this CCD camera 113 always serves as only a transverse plane of a body 116.

[0006] Therefore, when it is going to change the image pick-up direction by CCD camera 113, CCD camera 113 must turn to the covering person 111 the whole body

116 by turning a self head in the direction which desires an image pick-up, and he has to convert, and fatigue at the time of wearing of a head mount display 110 is large, and he has **** to which practicality falls while conversion of the momentary image pick-up direction is difficult.

[0007] Then, this invention is accomplished in view of the above-mentioned situation, and makes it a technical problem for the purpose to make conversion of the image pick-up direction in the image pick-up equipment of a head mount display format quicker and comfortable.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned technical problem, invention concerning this application claim 1 becomes from an image pick-up means picturize a covering person's visual field field, an image-display means carry out the image formation of the image picturized by this image pick-up means on said covering person's retina, a detection means detect said covering person's direction of a look, and the driving means that make the image pick-up direction of said image pick-up means follow in said direction of a look detected by said detection means.

[0009] Since according to invention concerning such a claim 1 a covering person's direction of a look is detected and the image pick-up direction of an image pick-up means is made to follow in the direction of a look, even if a covering person does not change the direction of the whole equipment, he can project on an image display means the direction for which it asks.

[0010] Invention concerning claim 2 has a maintenance means to hold said image pick-up means, said image display means, said detection means, and said driving means near said covering person's eyeball in one, in invention concerning claim 1.

[0011] Since it can equip with each means to constitute image pick-up equipment, in one according to invention concerning such a claim 2, the attachment and detachment become easy.

[0012] Invention concerning claim 3 has an image core migration means to move the core of an image that said image display means was picturized by said image pick-up means in a covering person's direction of a look, in image pick-up equipment

according to claim 1 or 2.

[0013] When according to invention concerning such a claim 3 it follows in a covering person's direction of a look and the image pick-up direction of an image pick-up means is changed by moving the core of the image displayed by the image display means in a covering person's direction of a look, it can prevent a gap arising in the object which the covering person is observing, and the object displayed on an image display means.

[0014] Invention concerning claim 4 has an assignment means to specify the photographic subject displayed on said image display means, and a notice means of a color to tell the color of this photographic subject specified by this assignment means, in image pick-up equipment according to claim 1, 2, or 3.

[0015] According to invention concerning such a claim 4, even if a covering person has visual disturbance, such as color amblyopia, the color of the picturized object can be recognized easily.

[0016]

[Embodiment of the Invention] The 1st operation gestalt of this invention is explained below to the 1st operation gestalt at a detail. Drawing 1 shows typically the internal configuration of the head mount display 100 in this operation gestalt, and drawing 2 R> 2 and drawing 3 are the perspective views showing the appearance.

[0017] In drawing 1 thru/or drawing 3 a head mount display 100 CCD cameras 3 and 3 which picturize the covering person's 1 visual field field 2, and the display units 5 and 5 which carry out image formation of the image picturized by these CCD cameras 3 and 3 on the covering person's 1 retina 4a, It consists of detection means 6 and 6 to detect the covering person's 1 direction of a look, and driving means 7 and 7 which make the image pick-up direction of CCD cameras 3 and 3 follow in the direction of a look detected by the detection means 6 and 6. In addition, in this operation gestalt, these means operate according to the power source supplied from a power unit 9.

[0018] CCD cameras 3 and 3 are image pick-up means to have an image pick-up field almost equal to the covering person's 1 visual field fields 2 and 2, and driving means 7 and 7 convert the image pick-up direction vertically and horizontally. And

with this operation gestalt, these CCD cameras 3 and 3 are covered with hood 3a of the shape of a transparent semi-sphere while they are formed in the two front sections of a body 8. Moreover, the spacing is set up almost equally to spacing of the covering person's 1 eyeballs 4 and 4, and these two CCD cameras 3 and 3 are arranged so that the direction of a look and the image pick-up direction of the covering person 1 may be in agreement. In addition, a spacing adjustment means may be formed in CCD cameras 3 and 3 in order to make spacing of the covering person's 1 eyeballs 4 and 4 suit about spacing of these CCD cameras 3 and 3.

[0019] Display units 5 and 5 consist of a finder 57 arranged so that the back light 51, the color LCD 52 and focus control 53 which were built in the flank of a body 8, the reflecting mirror 54 arranged on the optical axis of a focus 53, a lens 56 and a reflecting mirror 55, and the covering person's 1 eyeball 4 may be countered.

[0020] By these display units 5 and 5, the image picturized with CCD camera 3 is displayed on a finder 57 through a reflecting mirror 54, a lens 56, and a reflecting mirror 55, after projecting with the back light 51 and the color LCD 52 and adjusting a focus etc. with focus control 53.

[0021] A well-known technique can be used as detection means 6 and 6. The thing of a method which used infrared radiation is adopted with this operation gestalt.

Drawing 4 explains more the detection means 6 and 6 concerning this operation gestalt to a detail.

[0022] As shown in drawing 4 (a) thru/or (c), the detection means 6 and 6 irradiate infrared light at an eyeball 4 from the sources 60X and 60Y of infrared light by which contiguity arrangement was carried out at the eyeball 4, receive the reflected light by optoelectric transducers 61R, 61L, 61U, and 61D, and detect migration to dark-eyed right and left and the dark-eyed upper and lower sides.

[0023] If it explains in full detail, the optoelectric transducers 61R and 61L which detect the movement toward dark-eyed right and left will be arranged so that the reflected light from dark-eyed right-hand side and left-hand side may be received, respectively, after the iris of the eye has turned to the transverse plane, and the output will be amplified with amplifier 63. Moreover, both the optoelectric transducers 61U and 61D that detect a motion of the dark-eyed vertical direction are arranged so

that the reflected light from the dark-eyed bottom location of slant may be received, after the iris of the eye has turned to the transverse plane, and the output is amplified with amplifier 62. And the output from amplifier 62 and 63 is analyzed by the analysis circuit (not shown), and the covering person's 1 direction of a look is specified.

[0024] Driving means 7 and 7 make the upper and lower sides and right and left rotate CCD cameras 3 and 3 so that they may make the image pick-up direction of CCD cameras 3 and 3 follow in the covering person's 1 direction of a look detected by the above-mentioned detection means 6 and 6. The concrete configuration of these driving means 7 and 7 is shown in drawing 5 and drawing 6 . In addition, drawing 5 R> 5 is the perspective view of a driving means 7, drawing 6 (a) shows the idle state of a driving means 7, and this drawing (b) shows the rotation condition.

[0025] as shown in drawing 5 and drawing 6 (a), CCD camera 3 protrudes on the cube-like pedestal 70 -- having -- **** -- this pedestal 70 -- level shaft 70a -- an inner flame 71 -- receiving -- the upper and lower sides -- it is attached rotatable. Moreover, the motor 73 is formed in the pedestal 70, vertical rotation is carried out to an inner flame 71 by this, and this vertical rotation is braked by the brake mechanism 75.

[0026] A brake mechanism 75 consists of pan spring 75c which forces on a pedestal 70 side permanent magnet 75a which was inserted in level shaft 70a and fixed to the pedestal 70 side, electromagnet 75b by which opposite arrangement is carried out so that it may be inserted in level shaft 70a possible [a slide] and may oppose magnetically to permanent magnet 75a, and this electromagnet 75b.

[0027] And in order to rotate a pedestal 70 up and down, energize to electromagnet 75b and this is made to repel magnetically to permanent magnet 75a, electromagnet 75b is made to isolate from permanent magnet 75a, a brake is taken off, and it is made to rotate by the motor 73, as shown in drawing 6 (b). If the energization to electromagnet 75b is disconnected, magnetic repulsion will be lost, electromagnet 75b is forced on permanent magnet 75a by the elastic force of pan spring 75c, and rotation of a pedestal 70 is braked.

[0028] moreover, the inner flame 71 -- a pedestal 70 -- the same -- perpendicular shaft 71a -- an outer flame 72 -- receiving -- right and left -- it is attached rotatable. Furthermore, the motor 74 is formed also in this inner flame 71, and thereby, while

rotating an inner flame 71 right and left to an outer flame 72, that rotation is controlled by the brake mechanism 75 and the brake mechanism 76 equipped with the same configuration.

[0029] Moreover, with this operation gestalt, these CCD cameras 3 and 3, display units 5 and 5, the detection means 6 and 6, and driving means 7 and 7 are held near the covering person's 1 eyeball 4 in one at the body 8.

[0030] In order to hold this on the covering person's 1 head, the fixed belts 81 and 83 are formed in this body 8. The fixed belt 81 fixes a body 8 in the covering person's 1 upper head, and the fixed belt 83 fixes a body 8 in the covering person's 1 regio occipitalis capitis. Moreover, the dial-type adjusters 81a and 83a which perform bolting adjustment of this are formed in these fixed belts 81 and 83.

[0031] Since according to the head mount display 100 concerning such this operation gestalt the covering person's 1 direction of a look can be detected and the image pick-up direction of CCD cameras 3 and 3 can be made to follow in the direction of a look, even if the covering person 1 does not change the direction of the whole equipment, he can project on a display unit 5 the direction for which it asks.

[0032] Moreover, with this operation gestalt, since [which makes almost equal spacing of CCD cameras 3 and 3, and spacing of the covering person's 1 eyeballs 4 and 4] it was prepared, it should be more rich in the sense of reality in the image displayed by display units 5 and 5.

[0033] Furthermore, with this operation gestalt, in order to attach in a body 8 in one each means to constitute a head mount display device 100, attachment and detachment of this become easy.

[0034] The 2nd operation gestalt of this invention is explained below to the 2nd operation gestalt at a detail. With this operation gestalt, the means of displaying of the image projected on the display unit 5 in the 1st operation gestalt mentioned above is explained in full detail. In addition, the configuration of the whole head mount display concerning this 2nd operation gestalt is the same as that of the head mount display 100 in the 1st operation gestalt mentioned above.

[0035] And especially the display unit concerning this 2nd operation gestalt has an image core migration means (not shown) to move the core of the image picturized by

CCD cameras 3 and 3 in the covering person's 1 direction of a look.

[0036] This image core migration means is an operation means to process the image projected on a display unit 5 in this operation gestalt, and CPU built in a body 8 can realize this operation means.

[0037] Processing of the image by this image core migration means is explained with reference to drawing 7 below. In addition, drawing 7 shows the image pick-up image by CCD camera 3, and the display image by the display unit 5.

[0038] Now, as shown in drawing 7 (a), CCD camera 3 has caught the cylinder 701 in this side at the core of an image. As shown in drawing 7 (b), while the cylinder 701 has projected on the finder 57 of a display unit 5 at the core at this time, the covering person 1 is observing the core P1 of a finder 57.

[0039] And as shown in this drawing (b), suppose that the direction of a look was moved to P2 that the covering person 1 should observe the cube 702 which is back. Then, the detection means 6 detects change of a covering person's direction of a look, and changes the image pick-up direction of CCD camera 3 by the driving means 7.

[0040] Change of the image pick-up direction of CCD camera 3 catches a cube 702 at the core of CCD camera 3, as shown in drawing 7 (c). According to this, as shown in drawing 7 (d), in a finder 57, a cube 702 will project on the core P1 of an image, and a gap will arise from P2 which the covering person is observing.

[0041] Under the present circumstances, an image core migration means processes the image which computes and displays the variation rate from the core P1 of a display image to the attention part P2. That is, as shown in drawing 7 (e), the core P1 of a display image is moved to the location of P2, and it is made in agreement with P2 location where a covering person observes the object which CCD camera 3 has caught at the core.

[0042] In addition, although the order to which the core of a display image is moved that this should be amended explained after the gap arose between P1 and P2 for convenience in this operation gestalt If a display image is processed into detecting change of the covering person's 1 direction of a look, and changing the image pick-up direction, and coincidence and the core of a display image is moved [the drive of

a driving means 7] A display object can be smoothly projected in a covering person's direction of a look, and it can avoid giving the covering person 1 displeasure.

[0043] In order to move the core P1 of the image displayed on a display unit 5 in a covering person's direction P2 of a look according to the head mount display concerning the 2nd [this] operation gestalt which has such an image core migration means, when it follows in a covering person's direction of a look and the image pick-up direction of CCD camera 3 changes, it can prevent a gap arising between the objects displayed on the point which the covering person notes, and an image-display means.

[0044] In addition, in this operation gestalt, as a migration means based on images, although the image was processed with the operation means, this invention is not limited to this. For example, consider the finder 57 of a display unit 5 as a movable configuration vertically and horizontally, it is made to follow in a covering person's direction of a look, and the location of a finder 57 may be made to change.

[0045] Moreover, the display units 5 and 5 concerning this 2nd operation gestalt have an image amendment means to emphasize and display the profile of the picturized photographic subject. This image amendment means is realizable with arithmetic units, such as CPU which it had for example, in the body 8.

[0046] What emphasizes the profile of a photographic subject is employable by emphasizing the contrast of the image picturized, for example with CCD camera 3 as a method of this image amendment, reversing a hue, or extracting the profile of a photographic subject.

[0047] in addition, as an approach of extracting the profile of a photographic subject for example, the thing for which the difference of the newly picturized image and the image picturized before the predetermined period (for example, one-frame period) is taken -- or By memorizing the background image beforehand and taking the difference of this and an input image, a part with the motion in an image can be specified and the approach of processing noise rejection, labeling, a feature extraction, etc. to this can be used.

[0048] Furthermore, the head mount display concerning this 2nd operation gestalt is equipped with a notice means of a color to tell the color of the photographic subject

projected on the display unit 5. It notifies the analyzed color by displaying an alphabetic character etc. on the display means 5 like "RED" while this notice means of a color detects the covering person's 1 direction P3 of a look with the detection means 6, specifies the photographic subject 801 which the covering person 1 is observing and specifically analyzes that color, as shown in drawing 8 (a).

[0049] In addition, as an approach of notifying a covering person of this color, it displays in an alphabetic character etc. as mentioned above, and also the loudspeaker (not shown) built into the body 8, for example can also notify with voice.

[0050] Moreover, although assignment of a photographic subject that he wanted to identify a color was performed with this operation gestalt by detecting a covering person's direction of a look with the detection means 6, this invention is not limited to this and can also be manually specified using pointer equipment 90 as shown in drawing 8 (b).

[0051] That is, by [to which it pinches and 91 is moved vertically and horizontally] having been prepared, for example in the upper part of the grip 93 of pointer equipment 90, the point P3 projected on the finder 57 of a display unit 5 is moved on the photographic subject 801 of arbitration, by pushing a switch 92, the point P3 is locked, the color of the photographic subject is analyzed, and an alphabetic character, voice, etc. can notify a color.

[0052] As an example for realizing such a function, a circuit block as shown in drawing 9 is explained.

[0053] After separating the color of the output from CCD camera 3 as an image pick-up means three times, each signal of R, G, and B which were changed into the digital signal with A/D converters 94, 94, and 94 is supplied to level circuits 95, 95, and 95, respectively. And by supplying a control section 96, each signal level is compared and the output of level circuits 95, 95, and 95 can recognize the color information on a photographic subject with voice by making the result pronounce from a loudspeaker 99 through amplifier 98 through an electronic speech circuit 97 if needed. Moreover, it is also possible to also pronounce information, such as a condition of a photographic subject, suitably.

[0054] After the output from a control section 96 is changed into a predetermined

character code by the character code transducer 100 for outputting the recognized color information as text as text information on the other hand, it is changed into a predetermined pattern alphabetic character by the transducer 101, and is outputted to a display unit 5.

[0055] According to the head mount display device equipped with such a notice means of a color, the failure is suppliable even if a covering person has visual disturbance, such as color amblyopia.

[0056] The 3rd operation gestalt, next the 3rd operation gestalt of this invention are explained with reference to drawing 10 . As shown in this drawing, the head mount display 200 concerning this operation gestalt forms the 3rd image pick-up means 201 in the anterior part of the body 8 in the head mount display 100 in the 1st operation gestalt mentioned above.

[0057] The wide angle camera which can photo a large area rather than CCD camera 3 mentioned above can be used for this 3rd image pick-up means 201. And the image according to liking of a covering person can be displayed by changing suitably the image by CCD camera 3, and the image by this 2nd image pick-up means 201, and displaying on a display unit 5.

[0058] Drawing 11 is used and explained to the 4th operation gestalt pan about the 4th operation gestalt of this invention. The head mount display 300 concerning this operation gestalt isolates and establishes CCD camera 3 and a driving means 7 from a body 301, and it is made to picturize or drive these by remote operation, as shown in this drawing.

[0059] That is, while the display unit 5 and the detection means 6 which were mentioned above are attached in the body 301 which is a fixed means in one and these means are fixed in one near a covering person's eyeball, it attaches in a self-propelled means 302 by which CCD camera 3 and the driving means 7 were able to be established separately independently [a body 301].

[0060] A covering person is managed by remote operation and this self-propelled means 302 transmits the image picturized by the image pick-up means 3 attached in this. In addition, in this operation gestalt, this self-propelled means 302 is equipped with the wide angle camera 303 attached in that upper part rotatable, and it is

constituted so that the image which caught the large area by this, and the image which followed in the direction of a look of the covering person by CCD camera 3 can be changed suitably.

[0061] According to the head mount display 300 concerning such 4th operation gestalt, since the image pick-up location by CCD camera 3 and the display position by the display unit 5 can be isolated, a covering person can see the image of a different location from the location in which a covering person is present. Since it picturizes by following CCD camera 3 in a covering person's direction of a look at this time, in the narrow location which human being cannot enter according to this head mount display 300, and a dangerous location, the image which was rich in the sense of reality can be picturized.

[0062]

[Effect of the Invention] According to the image pick-up equipment of this invention, as explained above, conversion of the image pick-up direction in the image pick-up equipment of a head mount display format can be made quicker and comfortable, and while being able to picturize the image which was rich in the sense of reality, the fatigue at the time of wearing can be reduced.

TECHNICAL FIELD

[Field of the Invention] This invention picturizes the visual field range of a covering person, relates to the image pick-up equipment constituted so that image formation of the image might be carried out on a covering person's retina, and relates to the head mount display with which it equips in order to amend visual disturbance, such as dysopsia and color amblyopia, especially.

PRIOR ART

[Description of the Prior Art] The head mount display format is developed as

equipment which amends visual disturbance, such as the former, for example, the dysopsia, and color amblyopia. Drawing 12 is the top view showing the head mount display 110 for the conventional visual disturbance amendment.

[0003] A head mount display 110 consists of CCD camera 113 which picturizes the covering person's 111 visual field field 112, a finder 115 which carries out image formation of the image picturized by this CCD camera 113 on the covering person's 111 retina 114, and a body 116 for fixing each of these equipments to the covering person's 111 head in one in this drawing.

[0004] If it explains in full detail, CCD camera 113 picturizes the field 117 equivalent to the covering person's 111 visual field field 112, and after being amended, it will project with a color LCD 118, it will be reflected by the mirror 119, and it will project the picturized image on the finder 115 by which opposite arrangement was carried out at the covering person's 111 retina 114.

EFFECT OF THE INVENTION

[Effect of the Invention] According to the image pick-up equipment of this invention, as explained above, conversion of the image pick-up direction in the image pick-up equipment of a head mount display format can be made quicker and comfortable, and while being able to picturize the image which was rich in the sense of reality, the fatigue at the time of wearing can be reduced.

EFFECT OF THE INVENTION

[Effect of the Invention] According to the image pick-up equipment of this invention, as explained above, conversion of the image pick-up direction in the image pick-up equipment of a head mount display format can be made quicker and comfortable, and while being able to picturize the image which was rich in the sense of reality, the fatigue at the time of wearing can be reduced.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned technical problem, invention concerning this application claim 1 becomes from an image pick-up means picturize a covering person's visual field field, an image-display means carry out the image formation of the image picturized by this image pick-up means on said covering person's retina, a detection means detect said covering person's direction of a look, and the driving means that make the image pick-up direction of said image pick-up means follow in said direction of a look detected by said detection means.

[0009] Since according to invention concerning such a claim 1 a covering person's direction of a look is detected and the image pick-up direction of an image pick-up means is made to follow in the direction of a look, even if a covering person does not change the direction of the whole equipment, he can project on an image display means the direction for which it asks.

[0010] Invention concerning claim 2 has a maintenance means to hold said image pick-up means, said image display means, said detection means, and said driving means near said covering person's eyeball in one, in invention concerning claim 1.

[0011] Since it can equip with each means to constitute image pick-up equipment, in one according to invention concerning such a claim 2, the attachment and detachment become easy.

[0012] Invention concerning claim 3 has an image core migration means to move the core of an image that said image display means was picturized by said image pick-up means in a covering person's direction of a look, in image pick-up equipment according to claim 1 or 2.

[0013] When according to invention concerning such a claim 3 it follows in a covering person's direction of a look and the image pick-up direction of an image pick-up means is changed by moving the core of the image displayed by the image display means in a covering person's direction of a look, it can prevent a gap arising in the

object which the covering person is observing, and the object displayed on an image display means.

[0014] Invention concerning claim 4 has an assignment means to specify the photographic subject displayed on said image display means, and a notice means of a color to tell the color of this photographic subject specified by this assignment means, in image pick-up equipment according to claim 1, 2, or 3.

[0015] According to invention concerning such a claim 4, even if a covering person has visual disturbance, such as color amblyopia, the color of the picturized object can be recognized easily.

[0016]

[Embodiment of the Invention] The 1st operation gestalt of this invention is explained below to the 1st operation gestalt at a detail. Drawing 1 shows typically the internal configuration of the head mount display 100 in this operation gestalt, and drawing 2 R> 2 and drawing 3 are the perspective views showing the appearance.

[0017] In drawing 1 thru/or drawing 3 a head mount display 100 CCD cameras 3 and 3 which picturize the covering person's 1 visual field field 2, and the display units 5 and 5 which carry out image formation of the image picturized by these CCD cameras 3 and 3 on the covering person's 1 retina 4a, It consists of detection means 6 and 6 to detect the covering person's 1 direction of a look, and driving means 7 and 7 which make the image pick-up direction of CCD cameras 3 and 3 follow in the direction of a look detected by the detection means 6 and 6. In addition, in this operation gestalt, these means operate according to the power source supplied from a power unit 9.

[0018] CCD cameras 3 and 3 are image pick-up means to have an image pick-up field almost equal to the covering person's 1 visual field fields 2 and 2, and driving means 7 and 7 convert the image pick-up direction vertically and horizontally. And with this operation gestalt, these CCD cameras 3 and 3 are covered with hood 3a of the shape of a transparent semi-sphere while they are formed in the two front sections of a body 8. Moreover, the spacing is set up almost equally to spacing of the covering person's 1 eyeballs 4 and 4, and these two CCD cameras 3 and 3 are arranged so that the direction of a look and the image pick-up direction of the

covering person 1 may be in agreement. In addition, a spacing adjustment means may be formed in CCD cameras 3 and 3 in order to make spacing of the covering person's 1 eyeballs 4 and 4 suit about spacing of these CCD cameras 3 and 3.

[0019] Display units 5 and 5 consist of a finder 57 arranged so that the back light 51, the color LCD 52 and focus control 53 which were built in the flank of a body 8, the reflecting mirror 54 arranged on the optical axis of a focus 53, a lens 56 and a reflecting mirror 55, and the covering person's 1 eyeball 4 may be countered.

[0020] By these display units 5 and 5, the image picturized with CCD camera 3 is displayed on a finder 57 through a reflecting mirror 54, a lens 56, and a reflecting mirror 55, after projecting with the back light 51 and the color LCD 52 and adjusting a focus etc. with focus control 53.

[0021] A well-known technique can be used as detection means 6 and 6. The thing of a method which used infrared radiation is adopted with this operation gestalt.

Drawing 4 explains more the detection means 6 and 6 concerning this operation gestalt to a detail.

[0022] As shown in drawing 4 (a) thru/or (c), the detection means 6 and 6 irradiate infrared light at an eyeball 4 from the sources 60X and 60Y of infrared light by which contiguity arrangement was carried out at the eyeball 4, receive the reflected light by optoelectric transducers 61R, 61L, 61U, and 61D, and detect migration to dark-eyed right and left and the dark-eyed upper and lower sides.

[0023] If it explains in full detail, the optoelectric transducers 61R and 61L which detect the movement toward dark-eyed right and left will be arranged so that the reflected light from dark-eyed right-hand side and left-hand side may be received, respectively, after the iris of the eye has turned to the transverse plane, and the output will be amplified with amplifier 63. Moreover, both the optoelectric transducers 61U and 61D that detect a motion of the dark-eyed vertical direction are arranged so that the reflected light from the dark-eyed bottom location of slant may be received, after the iris of the eye has turned to the transverse plane, and the output is amplified with amplifier 62. And the output from amplifier 62 and 63 is analyzed by the analysis circuit (not shown), and the covering person's 1 direction of a look is specified.

[0024] Driving means 7 and 7 make the upper and lower sides and right and left

rotate CCD cameras 3 and 3 so that they may make the image pick-up direction of CCD cameras 3 and 3 follow in the covering person's 1 direction of a look detected by the above-mentioned detection means 6 and 6. The concrete configuration of these driving means 7 and 7 is shown in drawing 5 and drawing 6 . In addition, drawing 5 R> 5 is the perspective view of a driving means 7, drawing 6 (a) shows the idle state of a driving means 7, and this drawing (b) shows the rotation condition.

[0025] as shown in drawing 5 and drawing 6 (a), CCD camera 3 protrudes on the cube-like pedestal 70 -- having -- **** -- this pedestal 70 -- level shaft 70a -- an inner flame 71 -- receiving -- the upper and lower sides -- it is attached rotatable. Moreover, the motor 73 is formed in the pedestal 70, vertical rotation is carried out to an inner flame 71 by this, and this vertical rotation is braked by the brake mechanism 75.

[0026] A brake mechanism 75 consists of pan spring 75c which forces on a pedestal 70 side permanent magnet 75a which was inserted in level shaft 70a and fixed to the pedestal 70 side, electromagnet 75b by which opposite arrangement is carried out so that it may be inserted in level shaft 70a possible [a slide] and may oppose magnetically to permanent magnet 75a, and this electromagnet 75b.

[0027] And in order to rotate a pedestal 70 up and down, energize to electromagnet 75b and this is made to repel magnetically to permanent magnet 75a, electromagnet 75b is made to isolate from permanent magnet 75a, a brake is taken off, and it is made to rotate by the motor 73, as shown in drawing 6 (b). If the energization to electromagnet 75b is disconnected, magnetic repulsion will be lost, electromagnet 75b is forced on permanent magnet 75a by the elastic force of pan spring 75c, and rotation of a pedestal 70 is braked.

[0028] moreover, the inner flame 71 -- a pedestal 70 -- the same -- perpendicular shaft 71a -- an outer flame 72 -- receiving -- right and left -- it is attached rotatable. Furthermore, the motor 74 is formed also in this inner flame 71, and thereby, while rotating an inner flame 71 right and left to an outer flame 72, that rotation is controlled by the brake mechanism 75 and the brake mechanism 76 equipped with the same configuration.

[0029] Moreover, with this operation gestalt, these CCD cameras 3 and 3, display units 5 and 5, the detection means 6 and 6, and driving means 7 and 7 are held near

the covering person's 1 eyeball 4 in one at the body 8.

[0030] In order to hold this on the covering person's 1 head, the fixed belts 81 and 83 are formed in this body 8. The fixed belt 81 fixes a body 8 in the covering person's 1 upper head, and the fixed belt 83 fixes a body 8 in the covering person's 1 regio occipitalis capitis. Moreover, the dial-type adjusters 81a and 83a which perform bolting adjustment of this are formed in these fixed belts 81 and 83.

[0031] Since according to the head mount display 100 concerning such this operation gestalt the covering person's 1 direction of a look can be detected and the image pick-up direction of CCD cameras 3 and 3 can be made to follow in the direction of a look, even if the covering person 1 does not change the direction of the whole equipment, he can project on a display unit 5 the direction for which it asks.

[0032] Moreover, with this operation gestalt, since [which makes almost equal spacing of CCD cameras 3 and 3, and spacing of the covering person's 1 eyeballs 4 and 4] it was prepared, it should be more rich in the sense of reality in the image displayed by display units 5 and 5.

[0033] Furthermore, with this operation gestalt, in order to attach in a body 8 in one each means to constitute a head mount display device 100, attachment and detachment of this become easy.

[0034] The 2nd operation gestalt of this invention is explained below to the 2nd operation gestalt at a detail. With this operation gestalt, the means of displaying of the image projected on the display unit 5 in the 1st operation gestalt mentioned above is explained in full detail. In addition, the configuration of the whole head mount display concerning this 2nd operation gestalt is the same as that of the head mount display 100 in the 1st operation gestalt mentioned above.

[0035] And especially the display unit concerning this 2nd operation gestalt has an image core migration means (not shown) to move the core of the image picturized by CCD cameras 3 and 3 in the covering person's 1 direction of a look.

[0036] This image core migration means is an operation means to process the image projected on a display unit 5 in this operation gestalt, and CPU built in a body 8 can realize this operation means.

[0037] Processing of the image by this image core migration means is explained with

reference to drawing 7 below. In addition, drawing 7 shows the image pick-up image by CCD camera 3, and the display image by the display unit 5.

[0038] Now, as shown in drawing 7 (a), CCD camera 3 has caught the cylinder 701 in this side at the core of an image. As shown in drawing 7 (b), while the cylinder 701 has projected on the finder 57 of a display unit 5 at the core at this time, the covering person 1 is observing the core P1 of a finder 57.

[0039] And as shown in this drawing (b), suppose that the direction of a look was moved to P2 that the covering person 1 should observe the cube 702 which is back. Then, the detection means 6 detects change of a covering person's direction of a look, and changes the image pick-up direction of CCD camera 3 by the driving means 7.

[0040] Change of the image pick-up direction of CCD camera 3 catches a cube 702 at the core of CCD camera 3, as shown in drawing 7 (c). According to this, as shown in drawing 7 (d), in a finder 57, a cube 702 will project on the core P1 of an image, and a gap will arise from P2 which the covering person is observing.

[0041] Under the present circumstances, an image core migration means processes the image which computes and displays the variation rate from the core P1 of a display image to the attention part P2. That is, as shown in drawing 7 (e), the core P1 of a display image is moved to the location of P2, and it is made in agreement with P2 location where a covering person observes the object which CCD camera 3 has caught at the core.

[0042] In addition, although the order to which the core of a display image is moved that this should be amended explained after the gap arose between P1 and P2 for convenience in this operation gestalt If a display image is processed into detecting change of the covering person's 1 direction of a look, and changing the image pick-up direction, and coincidence and the core of a display image is moved [the drive of a driving means 7] A display object can be smoothly projected in a covering person's direction of a look, and it can avoid giving the covering person 1 displeasure.

[0043] In order to move the core P1 of the image displayed on a display unit 5 in a covering person's direction P2 of a look according to the head mount display concerning the 2nd [this] operation gestalt which has such an image core migration

means, when it follows in a covering person's direction of a look and the image pick-up direction of CCD camera 3 changes, it can prevent a gap arising between the objects displayed on the point which the covering person notes, and an image-display means.

[0044] In addition, in this operation gestalt, as a migration means based on images, although the image was processed with the operation means, this invention is not limited to this. For example, consider the finder 57 of a display unit 5 as a movable configuration vertically and horizontally, it is made to follow in a covering person's direction of a look, and the location of a finder 57 may be made to change.

[0045] Moreover, the display units 5 and 5 concerning this 2nd operation gestalt have an image amendment means to emphasize and display the profile of the picturized photographic subject. This image amendment means is realizable with arithmetic units, such as CPU which it had for example, in the body 8.

[0046] What emphasizes the profile of a photographic subject is employable by emphasizing the contrast of the image picturized, for example with CCD camera 3 as a method of this image amendment, reversing a hue, or extracting the profile of a photographic subject.

[0047] in addition, as an approach of extracting the profile of a photographic subject for example, the thing for which the difference of the newly picturized image and the image picturized before the predetermined period (for example, one-frame period) is taken -- or By memorizing the background image beforehand and taking the difference of this and an input image, a part with the motion in an image can be specified and the approach of processing noise rejection, labeling, a feature extraction, etc. to this can be used.

[0048] Furthermore, the head mount display concerning this 2nd operation gestalt is equipped with a notice means of a color to tell the color of the photographic subject projected on the display unit 5. It notifies the analyzed color by displaying an alphabetic character etc. on the display means 5 like "RED" while this notice means of a color detects the covering person's 1 direction P3 of a look with the detection means 6, specifies the photographic subject 801 which the covering person 1 is observing and specifically analyzes that color, as shown in drawing 8 (a).

[0049] In addition, as an approach of notifying a covering person of this color, it displays in an alphabetic character etc. as mentioned above, and also the loudspeaker (not shown) built into the body 8, for example can also notify with voice.

[0050] Moreover, although assignment of a photographic subject that he wanted to identify a color was performed with this operation gestalt by detecting a covering person's direction of a look with the detection means 6, this invention is not limited to this and can also be manually specified using pointer equipment 90 as shown in drawing 8 (b).

[0051] That is, by [to which it pinches and 91 is moved vertically and horizontally] having been prepared, for example in the upper part of the grip 93 of pointer equipment 90, the point P3 projected on the finder 57 of a display unit 5 is moved on the photographic subject 801 of arbitration, by pushing a switch 92, it acts as Locke of the point P3, the color of the photographic subject is analyzed, and an alphabetic character, voice, etc. can notify a color.

[0052] As an example for realizing such a function, a circuit block as shown in drawing 9 is explained.

[0053] After separating the color of the output from CCD camera 3 as an image pick-up means three times, each signal of R, G, and B which were changed into the digital signal with A/D converters 94, 94, and 94 is supplied to level circuits 95, 95, and 95, respectively. And by supplying a control section 96, each signal level is compared and the output of level circuits 95, 95, and 95 can recognize the color information on a photographic subject with voice by making the result pronounce from a loudspeaker 99 through amplifier 98 through an electronic speech circuit 97 if needed. Moreover, it is also possible to also pronounce information, such as a condition of a photographic subject, suitably.

[0054] After the output from a control section 96 is changed into a predetermined character code by the character code transducer 100 for outputting the recognized color information as text as text information on the other hand, it is changed into a predetermined pattern alphabetic character by the transducer 101, and is outputted to a display unit 5.

[0055] According to the head mount display device equipped with such a notice

means of a color, the failure is suppliable even if a covering person has visual disturbance, such as color amblyopia.

[0056] The 3rd operation gestalt, next the 3rd operation gestalt of this invention are explained with reference to drawing 10 . As shown in this drawing, the head mount display 200 concerning this operation gestalt forms the 3rd image pick-up means 201 in the anterior part of the body 8 in the head mount display 100 in the 1st operation gestalt mentioned above.

[0057] The wide angle camera which can photo a large area rather than CCD camera 3 mentioned above can be used for this 3rd image pick-up means 201. And the image according to liking of a covering person can be displayed by changing suitably the image by CCD camera 3, and the image by this 2nd image pick-up means 201, and displaying on a display unit 5.

[0058] Drawing 11 is used and explained to the 4th operation gestalt pan about the 4th operation gestalt of this invention. The head mount display 300 concerning this operation gestalt isolates and establishes CCD camera 3 and a driving means 7 from a body 301, and it is made to picturize or drive these by remote operation, as shown in this drawing.

[0059] That is, while the display unit 5 and the detection means 6 which were mentioned above are attached in the body 301 which is a fixed means in one and these means are fixed in one near a covering person's eyeball, it attaches in a self-propelled means 302 by which CCD camera 3 and the driving means 7 were able to be established separately independently [a body 301].

[0060] A covering person is managed by remote operation and this self-propelled means 302 transmits the image picturized by the image pick-up means 3 attached in this. In addition, in this operation gestalt, this self-propelled means 302 is equipped with the wide angle camera 303 attached in that upper part rotatable, and it is constituted so that the image which caught the large area by this, and the image which followed in the direction of a look of the covering person by CCD camera 3 can be changed suitably.

[0061] According to the head mount display 300 concerning such 4th operation gestalt, since the image pick-up location by CCD camera 3 and the display position

by the display unit 5 can be isolated, a covering person can see the image of a different location from the location in which a covering person is present. Since it picturizes by following CCD camera 3 in a covering person's direction of a look at this time, in the narrow location which human being cannot enter according to this head mount display 300, and a dangerous location, the image which was rich in the sense of reality can be picturized.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The top view of the head mount display concerning the 1st operation gestalt of this invention is shown.

[Drawing 2] It is the perspective view showing the appearance of the head mount display in the 1st operation gestalt.

[Drawing 3] It is the perspective view showing the appearance of the head mount display in the 1st operation gestalt.

[Drawing 4] It is the explanatory view showing the principle of the detection equipment in the head mount display concerning the 2nd operation gestalt of this invention.

[Drawing 5] It is the perspective view expanding and showing the image pick-up means in the head mount display concerning the 2nd operation gestalt of this invention.

[Drawing 6] It is the explanatory view showing the drive principle of the image pick-up means in the head mount display concerning the 2nd operation gestalt of this invention, and a driving means.

[Drawing 7] It is the explanatory view showing the drive principle of the image display means in the head mount display concerning the 2nd operation gestalt of this invention.

[Drawing 8] It is the explanatory view of the notice means of a color in the head mount display concerning the 2nd operation gestalt of this invention.

[Drawing 9] It is a circuit block diagram for realizing the function of the notice means

of a color in the head mount display concerning the 2nd operation gestalt of this invention.

[Drawing 10] The top view of the head mount display concerning the 3rd operation gestalt of this invention is shown.

[Drawing 11] The top view of the head mount display concerning the 4th operation gestalt of this invention is shown.

[Drawing 12] It is drawing showing the conventional head mount display.

[Description of Notations]

1 Covering Person

2 Visual Field Range

3 CCD Camera (Image Pick-up Means)

4 Eyeball

4a Retina

5 Display Unit (Image Display Means)

6 Detection Means

7 Driving Means

8 Body

9 Power Unit

100 Head Mount Display

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